Magnetic force Practice Test

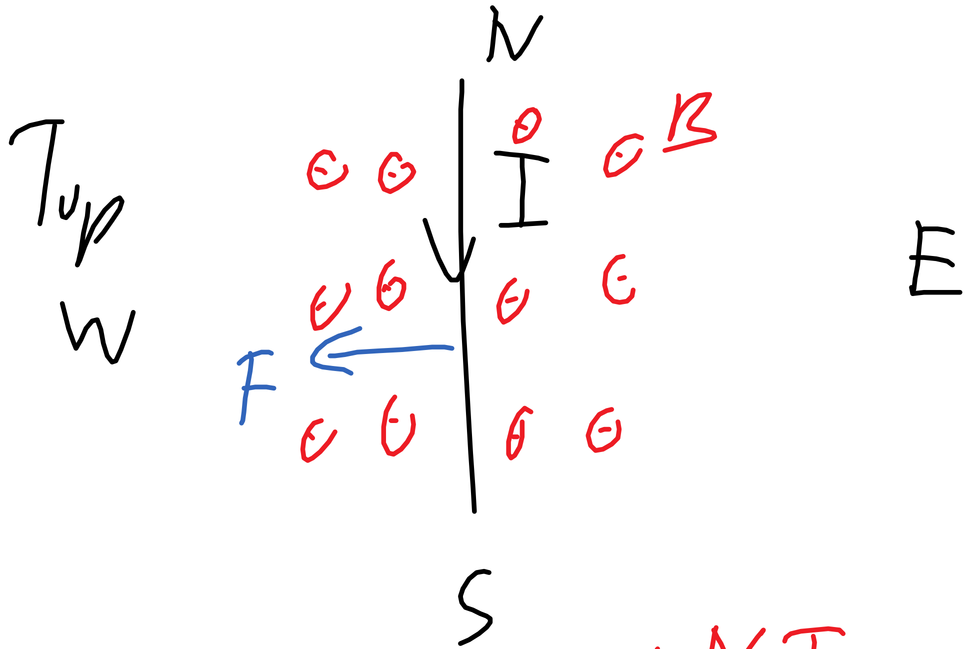
1. 0.167T

$$F_c = F_B$$

$$\frac{mv^2}{r} = qvB$$

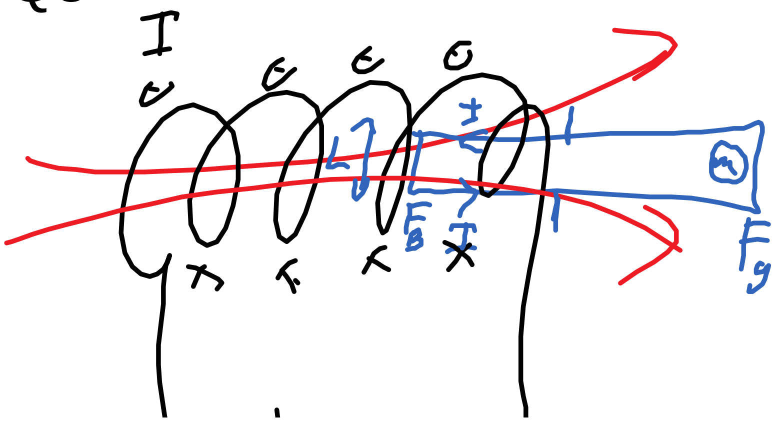
Q2 F=BIL

F1.5N/Am x 25A x 1.2m = 45N West



$$B = \mu_0 \frac{N}{L} I_{solenoid}$$

Q3



F=0 is I // B

F = BIL

$F_B = B I L_{\perp}$

$F_g = F_B$

$0.00014 kg \times 10 m/s^2 = 0.02 T \times I \times 0.035 m$

$I = 2.0 A$

b) double

Magnetic Induction (Chapter 21)

If you have a changing magnetic field, an electric field is induced. This results in an emf around a loop of wire. The same thing happens if the magnetic field is constant but the wire is moving.

What factors influence the magnitude of the emf?
Rate of change - an increase of the change in magnetic field or of the velocity of the conductor - increases the emf
the strength of the magnetic field, B
The area of the loops of wire, A in the field.

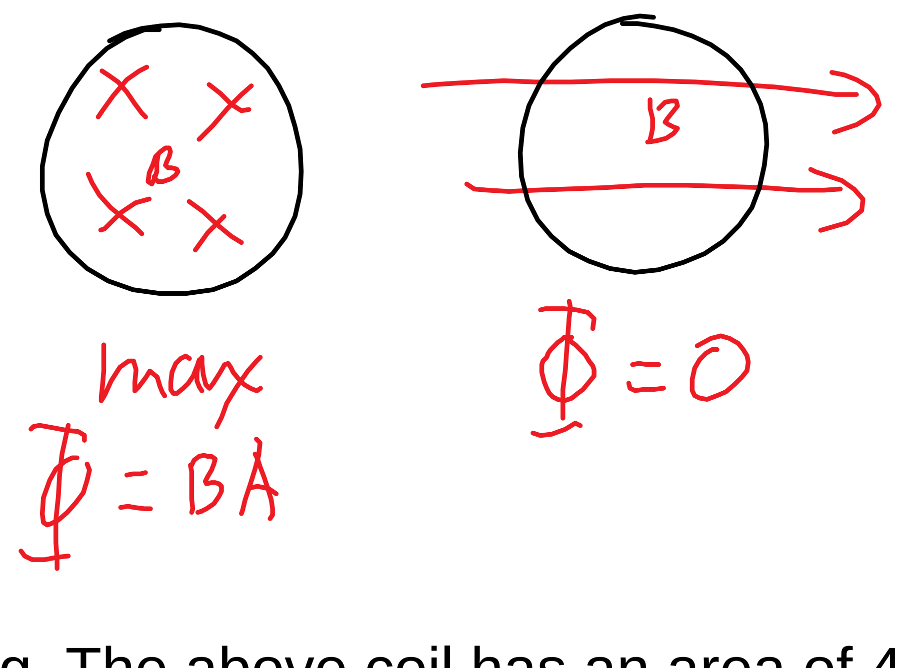
We call the product of the magnetic field and

the area the magnetic flux, Φ.
Units of flux are Webers, Wb = Tm^2

The emf induced

$$emf = -N\Delta\Phi/\Delta t$$

emf is the voltage around the loop, in V.
The negative sign indicates that the induced current creates a magnetic field opposing the change in flux.
N is the number of loops or turns in the coil.
Φ is the flux = $BA\cos\theta$
B is the magnetic field, in T
A is the area enclosed by the loop, in m^2
θ is the angle between B and the vector perpendicular to the area.
Max when   =0 when



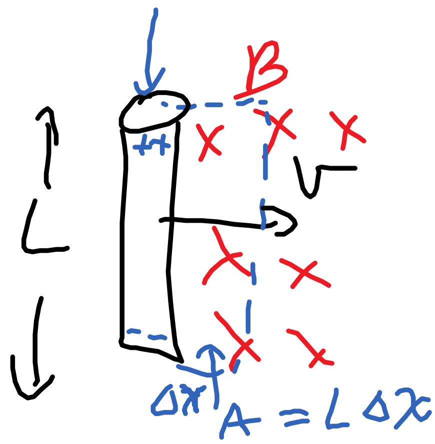
Eg. The above coil has an area of 4.0 cm^2 and is in

a 0.17 T magnetic field that starts into the page and changes to the right.
If the resistance of the loop is 0.20 ohms and it takes 0.30 s to steadily change the magnetic field (assume the vertical component changes linearly). What is
a) The direction of the induced current?
b) The magnitude of the induced current?

a) The induced current produces a magnetic field opposing the change. The field was into the page, so the induced current will produce a field into the page to oppose the change. Thus the current will be clockwise.

b) Emf = $-N\Delta\Phi/\Delta t$ ignore negative for magnitude
= 1 [(Bf-Bi) A]/t
=(0.17T)[4.0 cm^2 ($1m^2/10000cm^2$)]/0.30s
= 2.27×10^{-4}V
I=emf/R = 2.27×10^{-4}V/0.2ohms = 1.1mA

Moving Conductor



using RHR we see + at top an - at bottom

Area swept out

$$Emf = -\frac{N\Delta\Phi}{\Delta t} = \frac{B\Delta A}{\Delta t} = BL\frac{\Delta x}{\Delta t}$$

v

$$\boxed{Emf = BLv}$$

$emf = BLv$

Eg. An aluminum airplane with wingspan 10.0m is moving at 200.0 m/s near the North pole, with magnetic field strength 2.0×10^{-5}T.

What is the emf induced across the wings? Which wingtip is positive if you are flying towards the North?

P566 q1,2,3-13 odds

Next class, quiz magnetic force - notes motors and generators.